National Institute of Environmental Health Sciences

Anatomy of heat waves and mortality in Toronto: Lessons for public health protection

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Abstract:

BACKGROUND: Periods of unusually hot weather, especially in temperate climates, carry with them a burden of morbidity and mortality, particularly in urban areas. With lessening debate on its origins, and signs of global warming already apparent, it is becoming imperative for public health practitioners to recognize and predict the risks of "heat waves", and to develop protective community responses to them. This study makes use of historical data and a methodology developed previously to examine the pattern of hot weather experienced over the last five decades in the City of Toronto, and to assess the associated burden of mortality. METHODS: Synoptic classification of air masses based on meteorological data for Toronto was used, to assign the annual mean burden of illness (in terms of elevated mortality) associated with hot weather and air pollution. Then, coefficients relating daily mortality risk to historical daily weather and air quality data were determined with a model system that (for each air mass) assessed the factors that contributed to day-to-day variability in mortality. RESULTS: Over the period of study, there were 120 (95% CI: 105-135) heat-related deaths on average per year, with great variability from year to year, reflecting the variability of hot weather. Mortality was greatest in July and August, when the greatest number of multi-day heat episodes occurred. Furthermore, the longer the episode, the greater was the daily risk for mortality. INTERPRETATION: The method can be used to forecast the risk of heat-related mortality, and to facilitate the development of public health responses to mitigate that risk.

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Resource Description

Early Warning System: ☒

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

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Exposure : ☒

weather or climate related pathway by which climate change affects health

Air Pollution, Meteorological Factors, Meteorological Factors, Temperature, Other Exposure

Air Pollution: Ozone, Other Air Pollution

Air Pollution (other): CO;NO2;SO2;coefficient of haze

Temperature: Extreme Heat, Fluctuations

Other Exposure: dew point; cloud cover

Geographic Feature: ☑

resource focuses on specific type of geography

Urban

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Non-U.S. North America

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Injury, Other Health Impact

Other Health Impact: heat related mortality

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

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